Claims

1. A batch-melted, high-silver, borosilicate glass.

2. The batch-melted high silver glass according to claim 1 wherein the concentration of monovalent ions other than silver does not exceed 2 cation percent.

3. The batch-melted, high-silver glass according to claim 1, comprising high field strength ions.

4. The batch-melted, high-silver glass according to claim 3, wherein the high field strength ions are selected from the group consisting of aluminum, zirconium and tantalum.

5. The batch-melted, high-silver glass according to claim 4, wherein the high field strength ions comprise aluminum.

6. The batch-melted, high-silver glass according to claim 5, further comprising zirconia and/or tantalum.

7. The batch-melted, high-silver glass according to claim 6, characterized in that the ratio of aluminum to zircon is at least 3:1.

8. The melt- formed high silver glass according to claim 6, characterized in that the ratio of tantalum to alumina does not exceed 1:2.

9. The batch-melted, high-silver glass according to claim 3, characterized in that the ratio of high field strength ions to monovalent ions is at least 1.

10. The batch-melted, high silver glass according to claim 9, wherein the silver concentration is at least 8 cation percent.

11. A transparent, borosilicate glass produced by melting a batch containing a high concentration of silver, said glass having a high refractive index and said glass having negligible attenuation at wavelengths longer than about 400 nm.

12. The borosilicate glass according to claim 11, wherein the batch comprises, in cation percent, 15-60 SiO_2, 10-30 Al_2O_3, 10-45 B_2O_3, and 8-25 Ag_2O.

13. The borosilicate glass of claim 11, further characterized by being essentially colorless.

14. The borosilicate glass according to claim 11, wherein the cation concentration of Ag is between 12.5 cation percent and 25 cation percent.

15. The borosilicate glass according to claim 14 wherein the cation concentration of Ag is less than or equal to the concentration of Al.

16. The borosilicate glass according to claim 11, wherein the SiO_2 concentration is between 20cation percent and 45 cation percent.

17. The borosilicate glass according to claim 11, wherein the concentration of B_2O_3 is between 15 cation percent and 30 cation percent.

18. The borosilicate glass according to claim 11, wherein the cation concentration of Ag is in the range of 12.5 to 25 cation %, the cation concentration of Al is equal to the cation concentration of Ag, and the concentration of SiO_2 is in the range of 20 to 40 cation %.

19. The borosilicate glass according to claim 11, characterized in that the Ag ions can be replaced by less polarizable monovalent ions by the process of ion exchange.

20. A method of making an alkali-free, high-silver, borosilicate glass by:

a) mixing a batch that is essentially free of polyvalent ions, free of alkali or alkaline earth ions and containing at least as many high field strength ions as it does silver atoms; and

b) melting the batch for a time sufficiently long to produce a homogeneous glass.

21. The method according to claim 20, wherein the batch is melted at a temperature between 1350°C and 1500°C for a period of time between six hours and seventy two hours.

22. A lens comprising the glass according to claim 1.

23. A gradient index lens formed by subjecting the glass of claim 10 to an ion-exchange process.

24. A method of making a high-silver, borosilicate glass by:

a) mixing a batch that is essentially free of polyvalent ions, and comprising at least 2 cation percent alkali;

b) working the batch to produce a finely divided intimately mixed batch;

c) melting the glass at a temperature not exceeding 1500°C for at least four and preferably sixteen hours to produce a homogeneous melt.

25. The method according to claim 25 wherein working the batch involving ball milling to produce a finely divided intimately mixed batch wherein the particles exhibit a mean particle size of about 12 μm mps with substantially all of the particles exhibiting a particle size of less than 40 μm.

26. The method according to claim 25 wherein the ball milling involves maintaining a high media to batch ratio of 15:1